DOCUMENT RESUME

ED 044 902 56 EM 008 518

AUTHOR Friedman, Herbert L.; And Others
TITLE Further Research on Speeded Speech as an Educational Medium. Effects of Listening Aids and Self-Pacing on Comprehension and the Use of Compressed Speech for Review. Progress Report Number 4.
INSTITUTION American Institutes for Research, Washington, D.C.
SPONS AGENCY Office of Education (DHEW), Washington, D.C. Educational Media Branch.
REPORT NO AIR-E-50-2-67-TR-4
PUB DATE Feb 67
GRANT OEG-7-48-7670-267
NOTE 75p.

EDRS PRICE EDRS Price MF-$0.50 HC-$3.85
DESCRIPTORS Abstracts, Aural Learning, Independent Reading, Instructional Aids, *Listening Comprehension, Listening Skills, Multiple Choice Tests, Review (Reexamination), Self Pacing Machines, *Speech Compression
IDENTIFIERS Tempo Regulator

ABSTRACT

The studies reported here are a continuation of research into the comprehension of time-compressed speech by normal college students. In the Listening Aid Study II, an experiment was designed to retest the advantages of the precis as a listening aid when the precis expressed the overall meaning of a passage. Also, a new listening aid was introduced which provided a short, pure tone to indicate crucial sentences. The hypothesis that listening aids would improve performance was not borne out. In the Self-Pacing Study, it was discovered that listeners tended to choose a rate of speed very close to the speed at which they first heard compressed speech (1.5x normal recording speed), and that there were no clearcut differences between self- and externally-paced conditions. In another study, 11 passages were selected from an introductory textbook on psychology and recorded. They were then the basis for the development of standardized multiple-choice tests. A fourth study, done on the use of compressed speech as a review technique, indicated that reading was a superior technique for review. However, four of the eleven subjects in the experiment said that they preferred compressed speech for review. Two findings of previous research were reaffirmed; compressed speech is acceptable and practice is desirable. (MF)

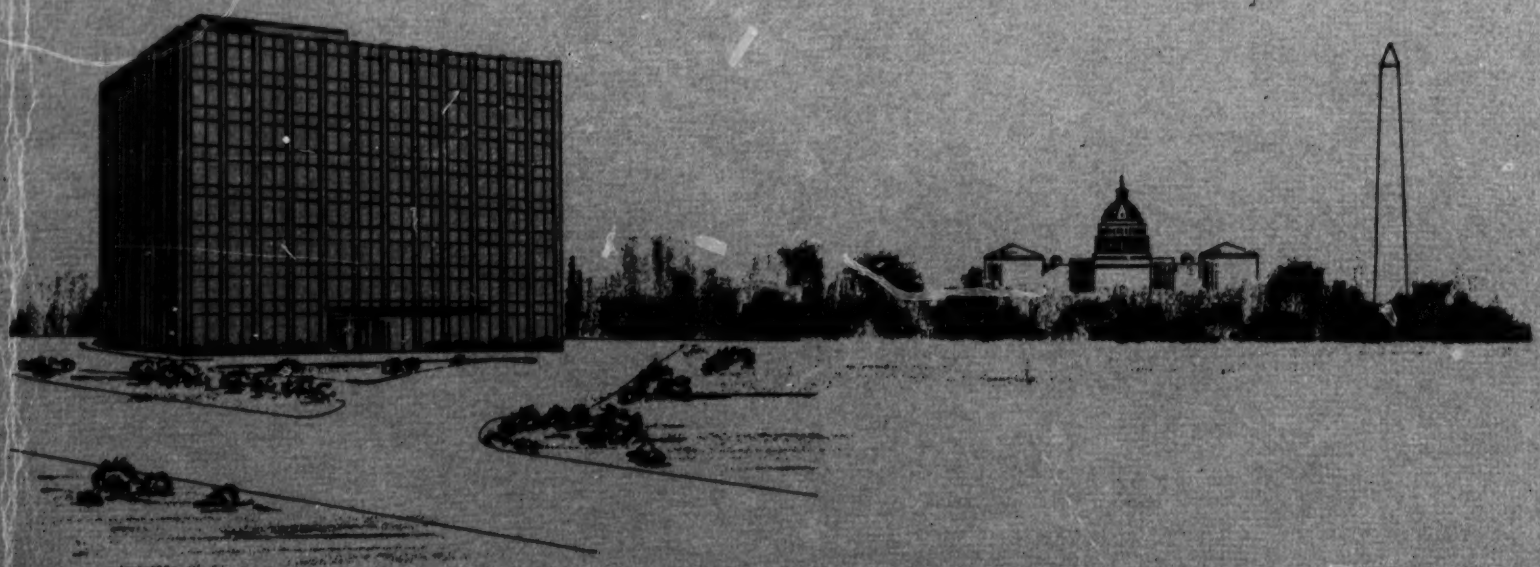
ED044902

Further Research on Speeded Speech as an Educational Medium--

Effects of Listening Aids and Self-Pacing on Comprehension and the Use of Compressed Speech for Review

Herbert L. Friedman
Cynthia Norris Graae
David B. Orr

FEBRUARY 1967



EM008518

AMERICAN INSTITUTES FOR RESEARCH
WASHINGTON OFFICE
Address: 8555 Sixteenth Street, Silver Spring, Maryland 20910
Telephone: (301) 587-8201

R67-2

ED044902

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

AIR - E-50 - 2/67 - TR(4)

FURTHER RESEARCH ON SPEEDED SPEECH AS AN EDUCATIONAL MEDIUM

Effects of Listening Aids and Self-Pacing on Comprehension and the Use of Compressed Speech for Review

Herbert L. Friedman

Cynthia Norris Graae

David B. Orr

PROGRESS REPORT NO. 4

Prepared under Contract for

U. S. Office of Education

Washington, D. C.

Principal Investigator: David B. Orr

Grant No. 7-48-7670-267

American Institutes for Research
Washington Office
Communication Research Program

February 1967

ACKNOWLEDGMENTS

The authors wish to express their appreciation of the continued interest of the New Educational Media Branch of the U. S. Office of Education, who supported this research under Grant No. 7-48-7670-267, with special thanks to our monitor, Dr. Andrew Molnar.

The authors would also like to express their indebtedness to others who have provided valuable assistance in the conduction of the research, in particular, Mrs. Juanita C. Condon and Mr. John D. Zimmerman.

Not least, we wish to thank the many students at the University of Maryland and Georgetown University who have given their time and energy to act as subjects in the experimental research.

TABLE OF CONTENTS

List of Tables and Figures		iv
Introduction and Background		1
Section I	Listening Aid Study II	3
Section II	The Self-Pacing Study	15
Section III	The Use of Compressed Speech as a Review Technique	36
Section IV	Listening Aid Study II Extension	41
Section V	Overall Summary	48
References		50
Appendix A		A-1
Appendix B-1		B-1
Appendix B-2		B-2
Appendix C		C-1

Tables and Figures

Number	Table	Page
1	Mean Listening Test Scores and Mean Percentages of Normal Speed Scores by Group and Rate of Presentation in Order of Presentation	8
2	Experimental Procedures in Order of Presentation	18
3	Mean Number of Increases and Decreases in Speed, Per Quarter for Self-Paced Passages	20
4	Time Compressed Listening Comprehension for 12 Subjects under Experimentally and Self-Paced Conditions	22
5	Rank Order of Performance on Each Passage, by Subject	23
6	Correlation between Rate of Listening and Extent of Comprehension for Self-Paced Passages	24
7	Characteristics of Psychology Passages as Recorded for Use in Research on Speeded Speech as an Educational Medium	31
8	Characteristics of Tests as Standardized on a College Population	35
9	Mean Scores on Passage Tests by Group	39
10	Mean Scores and Per Cent of Normal Speed Scores of Trained Listeners on New and Familiar Material Presented at Two Times Normal Speed	45

Figure

1	Mean Percentages of Normal Speed Comprehension for Five Passages with Listening Aids and One Without	10

Introduction and Background

Since 1963, research has been conducted at the American Institutes for Research investigating factors associated with the comprehension of time-compressed speech by normal college students. This research has been sponsored by the New Educational Media branch of the Office of Education. Its main focus has been on the applicability of time-compressed speech in the educational setting. Time compression is a technique, developed in recent years, which permits a shortening of the duration of tape recorded material by electronically slicing out minute segments of the record, while abutting the remainder together. The frequency with which that slice is made determines the speed with which the speech record is presented. The new effect is faster speech which is not distorted as to pitch, and which essentially preserves the overall intonation pattern.

A review of the literature appears in earlier progress reports and will not be discussed in detail here, but the following points are, perhaps, worth reiterating. The initial impetus for compressed speech research appears to have come from work of Miller and Licklider in which the intelligibility of speech signals was preserved in spite of the fact that considerable portions of the record were absent. Garvey then psysically cut out minute segments of tape recordings for faster playback with good results. Fairbanks developed a device to do electronically what Garvey had done by hand, and once again found that a considerable portion of the speech record could be deleted before severe loss of comprehension occurred. Bixler, Foulke, et al began to examine compressed speech presentation with blind subjects.

The major work in the area of training of comprehension of compressed speech by normal subjects has been conducted by the authors.

The results of this research have been favorable in two major respects: Exposure to compressed connected discourse leads to significant improvement in comprehension; and this mode of presentation of historical and literary material at the college level is acceptable

to the vast majority of students (more than one hundred and fifty) who have participated in the experiments to date.

Previous experiments, described in earlier reports, have examined the effects of duration, rate, continuity, and amount of exposure to compressed speech on the comprehension of new material presented in compressed form. Most research has suggested that material recorded at about 175 words per minute when compressed to 250-275 wpm remains completely intelligible. Beyond that point, some loss occurs. With training our best groups have achieved 90-100% mean scores at 375 wpm, and 80% at 425 wpm. Retention of what has been learned via compressed presentation has been shown (within the limits of these experiments) to be at least as good, if not better, than retention of material learned at normal speed. A study designed to examine the effects of preparing subjects for the content of the tape by means of summaries and key word lists did not prove to be effective relative to a control group (although both groups showed significant improvement in comprehension). That study was repeated in modified form and is described in this report. In addition to that the question of self-pacing vs. externally-paced presentation is examined, as is the use of compressed speech as a means to review material with which the subject is already familiar. The standardization of new material for a later study to compare the suitability of different types of material for compressed presentation is also described in this report.

Finally, the next steps in the proposed research are described and implications for future research.

Listening Aid Study II

Introduction

In the early studies conducted under this grant, listeners had been prepared for compressed speech listening by variations in the practice listening schedule which included manipulation of the duration, continuity, and speed of presentation of material. While those variables are of significance in the training of listening to compressed speech, there is another which was felt to be of importance, preparation for content of the material to be heard. It is customary, for example, to ask students to read material before coming to class to listen to the lecturer. Because compressed speech directly affects the duration for which a message is played (it is presented in less time) it is hypothesized that part of the reason for a drop in tested comprehension at high speeds is a result of a lack of time to process the material even though there may be sufficient time to identify it. It was further hypothesized that one way to reduce the time needed for overall integration of an auditory message is to shorten the time taken for recognition. By reducing the number of anticipated alternatives it was expected that recognition time would be shortened. This has been shown in earlier research by Miller (1951). In the first Listening Aid Study (see Progress Report #3, July 1966) preparing the listener for the content was attempted by two means: (1) A precis of the material to be heard was presented in printed form to one group prior to presentation, and (2) A list of key words to appear in the passage was presented to another group. A third group acted as control, with no listening aid provided.

The results of that experiment were unexpected. While all three groups showed significant improvement in their ability to comprehend compressed speech at 375 wpm, no statistically significant differences among groups were found. The failure of the listening aids to help performance was taken with a grain of salt. We felt that it was partially attributable to the fact that the precis and key word lists were carefully designed not to provide answers to questions on the test. In doing so we felt we may have diminished their relevance to overall comprehension.

We also considered another possibility, that presentation of the listening aids in this experiment tended to focus too much attention on detail, rather than overall meaning, particularly with regard to the key word list.

A new experiment was designed to retest the potential advantages of listening aids of this type. The precis were modified in such a way as to focus more on the overall meaning of the passage, and point to sections relevant to the questions - while not actually providing answers. The key word list was dropped since we felt it may have caused the listener to listen only for those words. A new listening aid was introduced which provided a short pure tone to indicate crucial sentences in the text. It was hypothesized that this attention gathering device during presentation would seem to highlight relevant sections and make the listener more alert. A new control group was also run.

In addition to the examination of the listening aid question with these subjects, it was planned to use the subjects again following completion of this experiment, in another study to examine the usefulness of compressed speech as a review technique with trained listeners and to measure the degree to which listening skill was retained. This experiment is described in a later section of this report.

Procedures

Subjects. Twenty-five male students from a local university (six seniors, eight juniors, eight sophomores, and three freshmen) participated in the experiment. Their ages ranged from 18 to 24.5 years with a mean age of 20.6 years. The majority of the subjects were born on the East Coast. None had marked regional accents, all spoke English as their native language, and none of the finally selected subjects had marked hearing loss in either ear. Only one subject had had training in rapid reading, none had had any training in rapid listening. Their major subjects represented a cross-section of academic fields.

Subjects were tested in groups. They were paid approximately $1.50 per hour plus $1.00 per session for carfare. Three $10.00 bonuses were awarded, one to a member of each group, the subjects having been informed

in advance that bonuses would be given on the basis of performance.

Materials. The listening materials used were identical to materials used in previous experiments conducted under this grant. Seven historical passages were taken from a single college level textbook on English history. Six of the passages were compressed from a normal recording speed of approximately 175 wpm, to 375 wpm. The remaining passage was used at normal speed. For each passage a previously standardized five-option multiple choice test of 25-30 items was used. In addition to this a precis was prepared for each compressed passage. These precis were approximately 250 words long; those for passages with thirty item tests were slightly longer. The precis were so constructed that they focused on the content of approximately nine-tenths of the test questions, without revealing anything about the answers to those questions. The precis were edited for unity and smooth reading. See Appendix A for samples of precis, passage and test. The passage texts were also examined for sentences which were most crucial to performance on the comprehension tests. Immediately prior to 80% of these sentences, a tone was superimposed on one channel of a two channel tape recording.

In addition to the above materials, two passages taken from a book on introductory psychology[1] were recorded at normal speed[2] for presentation during this experiment as well as for later use during the measurement of compressed speech as a review technique for these subjects (discussed later in this report). For these passages five-option multiple choice tests of 40 to 45 items each had been prepared

---

[1]Miller, George A. Psychology, The Science of Mental Life, Harper & Row New York, 1962, Pp 1-172.

[2]Previously words per minute have been used to calculate a constant normal speed rate; however, the syllable to word ratio has been fairly constant (about 1.4 to 1.5 syllables per word.) The psychology material had a syllable to word ratio of between 1.6 and 1.7. Thus, in order to equate normal speed for these different types of material it was necessary to calculate normal speed on the basis of syllables per minute.

for later standardization and item analysis with a college population. These unstandaridized tests were used for the two psychological passages. Practice material consisted of a "talking book"[3] previously compressed to 375 wpm.

Equipment used consisted of a Magnecord tape recorder, a Bogen amplifier, three Electro-Voice speakers, ancillary wiring, and a pure tone audiometer and head set. The tape recordings were presented free field.

Design. The basic design was essentially a replication of the design used for the earlier Listening Aid Study including order of passage presentation. Following an introduction by the experimenter the subjects completed a biographical questionnaire. An initial measure of performance at normal recording speed (175 wpm) was then taken using one of the historical passages and accompaning test for the purposes of establishing baseline performance and dividing the subjects into three matched groups. In the only departure from the schedule used in the earlier Listening Aid Study two psychology passages were played at normal speed, each followed by a multiple choice comprehension test. Since this was presented before high speed it was felt that this would not interfere with basic design.

These three passages and tests were administered on the first day of testing (a Monday, as in the previous Listening Aid Study.) The experiment was conducted for seven consecutive weekdays. The five subsequent sessions followed the pattern described below: The subjects were divided into three matched groups, one which read the precis immediately prior to listening, one which heard the tone while listening, and a third group (control) with no special treatment.

The subjects were tested simultaneously in two groups; the tone group in one laboratory, and the control and precis groups in another. All groups were reminded that a comprehension test would follow each passage. The tone group was instructed to expect the tone at important

---

[3]Beach, Edward L., Run Silent, Run Deep, Holt, Rinehart and Winston, New York, 1955, Pp. 364.

points during the passage. The precis group was instructed that the precis was an overall summary of the material they would hear.

During each of the five sessions all three groups listened (with no listening aids) to approximately fifty minutes of Run Silent, Run Deep. This was followed by a ten minute break. After the break subjects in the precis group were each given two and one-half minutes to study a typewritten summary of the passage to follow, while the other subjects sat quietly. All subjects then listened to the test passage at 375 wpm. The tone group (in a separate laboratory)heard a tone just prior to important sections of the passage.

On the seventh day the above procedure was followed except that no subjects received any listening aids. This was done to provide a measure of generalization of performance from previous sessions. In addition to that, each of the three groups was subdivided into two matched subgroups. An attempt was made to match subjects on current proficiency in listening to compressed speech. To this end mean scores on the previous two sessions' tests were used as the matching criterion. One of each pair of subgroups received a precis followed by a test, while the other group received only the test. No passage was presented for these tests. The purpose of this was to confirm that the precis itself was not providing answers to the test. Subjects were then dismissed and reminded that they would be recalled for a later session.

Findings

Before going on to the substantive results of this study, it should be pointed out that the final test on which no passage was given confirmed the experimenter's expectations that the precis did not give specific help in answering test questions. There was no significant difference between the scores of those subjects who received the precis and those who did not on this test, as illustrated in Table 1.

The major hypothesis of this study was that the use of listening aids would improve performance relative to a control group without listening aids. This was not borne out. There was no significant

Table 1

Mean Listening Test Scores[a] and Mean Percentages of Normal Speed Scores by Group and Rate of Presentation in Order of Presentation

Subject Group	Word Rate Per Minute and "C" Passage Designation								
	175 C-1	375 C-7	375 C-8	375 C-6	375 C-3	375 C-2	375 C-4[b]	No Passage[c] C-5[d]	No Passage[c] C-5[e]
Precis (N=9)	14.19	7.69	9.00	6.53	10.56	14.86	9.17	4.85	2.38
Per cent	100.00	54.25	69.65	52.44	86.80	114.84	71.85	45.40	18.84
Tone (N=7)	14.61	7.71	11.18	10.04	10.86	12.56	11.71	4.00	6.12
Per cent	100.00	44.25	73.99	69.44	78.87	89.57	72.09	25.68	46.20
Control (N-9)	14.19	7.28	11.03	8.06	9.81	12.94	13.69	5.25	4.35
Per cent	100.00	46.67	76.34	55.37	71.66	94.09	98.15	38.84	32.19
All Subjects (N=25)	14.31	7.55	10.34	8.06	10.38	13.53	11.51	4.77	4.29
Per cent	100.00	48.72	73.28	58.25	79.13	100.29	81.39	38.28	32.39

[a] Scores were prorated to a base of 25 items and corrected for guessing.

[b] This passage and test was administered to all subjects without any listening aids.

[c] Approximately one-half of each group is represented in each column.

[d] All subjects in this column received a precis prior to the test.

[e] No subjects in this column received any listening aids prior to this test.

difference between the groups according to an analysis of variance.

An additional hypothesis predicted that improvement in performance as a result of the use of listening aids in practice would generalize to performance on a passage given at the end of the experiment without listening aids. This prediction was not confirmed.

A third hypothesis was that all subjects would improve with practice. This proved to be the case according to an analysis of variance. ($\underline{F}$ = 18.4602; $\underline{df}$ = 4,164; $\underline{p}$ / .001), the same analysis having shown that no differences between groups existed.

An examination of group mean scores on successive days of practice shows an upward trend with a setback on the fourth day. It should be noted that a setback occurred on the fifth day of experimentation in the previous Listening Aid Study. Since the passage order and other conditions were the same it seems likely that an artifact was responsible for the sharp decline in performance. In this study there was general complaint on the day of the decline that the volume level was set too low. Table 1 and Figure 1 illustrate these results. Apart from this setback for all groups combined, performance expressed as a percentage of normal speed score rose from 49% on the first day of practice to 100% on the last day of practice with listening aids. Twenty-one of twenty-five subjects did better than 80% of normal speed score on this day. On the final day of testing without listening aids, 14 of the twenty-five subjects did better than 80%. This represents a decline in performance, but was not typical of all three groups. Although as noted earlier an analysis of variance showed the differences between groups were not statistically significant, the data are nevertheless highly suggestive on this point. While the direction of change in performance was the same for all groups during the course of listening training, on the final day of testing when the listening aids were removed for all groups, the control group continued to improve while the two experimental groups showed a marked decline, as illustrated in Figure 1.

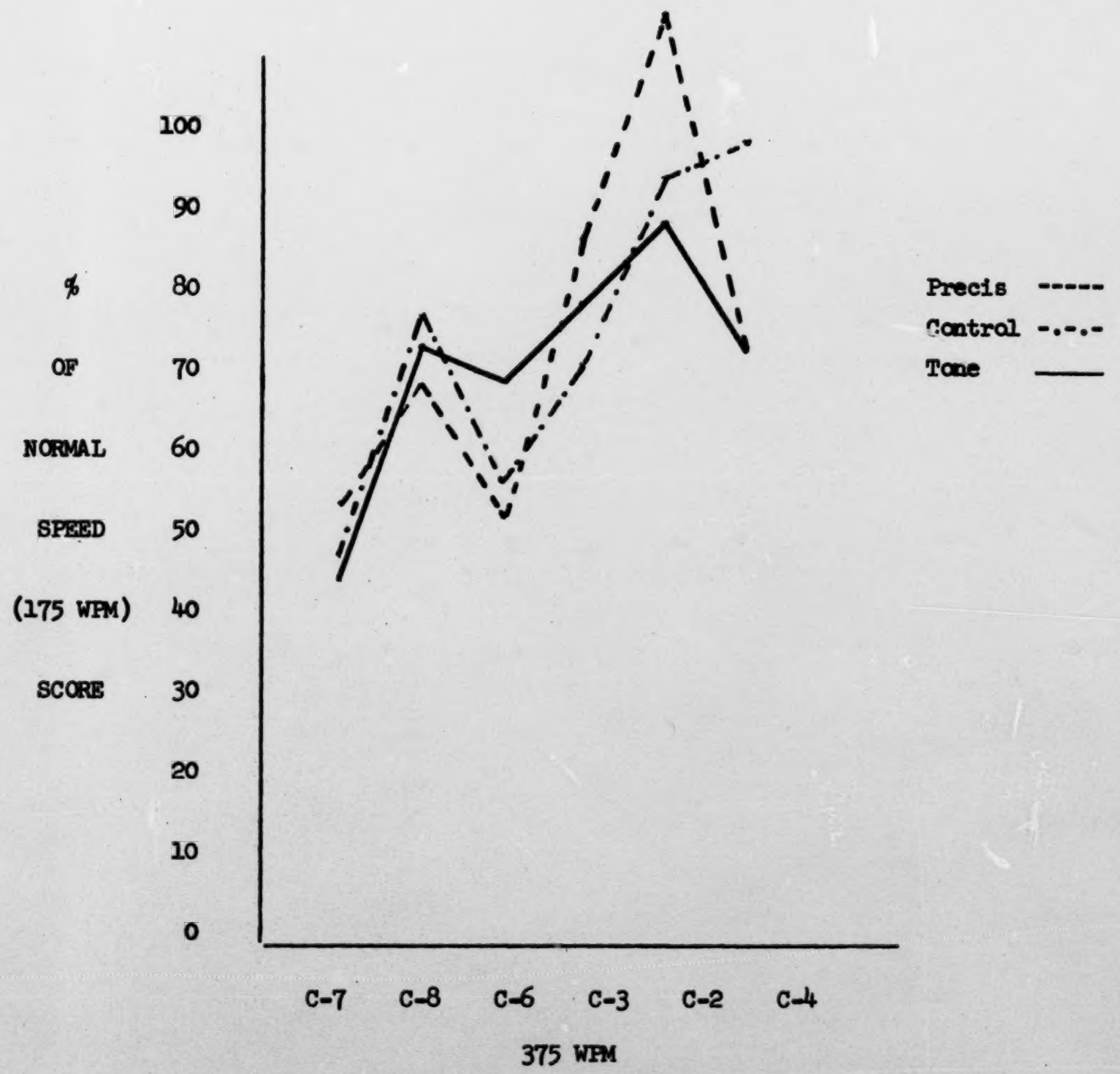


Fig. 1 Mean percentages of normal speed comprehension for five passages with listening aids and one without (C-4).

Performance within groups was examined from the point of view of the degree of relative skill exhibited over time. A coefficient of concordance (Kendall's W) was determined for each of the three groups and showed a significant degree of association in ranking from first through last presentation of the passage tests. For precis, tone, and control groups respectively s = 1193,50, w = .406, x^2 = 22.74, df = 8, p / .01; s = 940.50, N = 7, K = 7, p / .01; s = 2119,50, w = .721, x^2 = 40.37, df = 8, p / .001. This suggests that relative marks were maintained over time for all groups. A comparison of the current Listening Aid Study with the previous one shows the following:

An analysis of variance performed on the six groups participating in both experiments shows no statistically significant differences among any of them.

Results for all subjects (N = 47) were combined. Two tests were performed, one comparing normal speed scores (initial baseline test) with the last listening aid test, and the other comparing it with the last no listening aid test. These tests showed a significant decline from normal to both high speed tests. (p / .05, and p / .001, respectively).

Discussion

The findings of this study are very similar to that of the last one. The predicted boost to listening comprehension provided by listening aids prior and, in one case, during the presentation, did not materialize. While significant differences did not appear between any of the groups, there is at least a suggestion that by the end of the experiment the control groups of both experiments were performing in a superior fashion without listening aids. On the last passage without listening aids the mean score for the control groups was better than the mean score for either of the two groups with which they were matched. On the last test with listening aids, the precis group in the second Listening Aid Study did best with a mean score better than normal speed performance. But the best group under this condition in the first study was the control group; in the second study, the control group did quite well too, achieving 94% of their normal speed scores.

The precis group in the second Listening Aid Study merits some further consideration. Of all six groups, this one alone shows a consistent trend over the last three listening aid passages. Eight of nine subjects show a consistent upward trend over these three passages (the remaining subject drops slightly on the second). The mean score achieved on the last test employing listening aids was 115% of normal speed score, considerably better than any of the other five groups. (It should be remembered that the same order of passage presentation was used for all groups). There is thus a strong suggestion that this group had learned to make good use of their listening aid. As further evidence of this, performance on the next passage presented for which no listening aid was administered to any group, shows a marked decline. Not only did eight of nine subjects show a decrease in score, but the mean score was lower than any of the other five groups on this test. It is suggested that they had come to depend on the listening aid provided.

If this is true, or to put it another way, if the tentative results would have become statistically significant had the experiment continued longer; then a new problem must be dealt with. Preparation for the content of a passage was expected to enhance the speed with which the listener could recognize and integrate compressed speech. It seems likely that practice in using the precis in this experiment in conjunction with listening practice was beginning to have the desired effect. In those groups which failed to benefit from listening aids there is no indication that their withdrawal hurt performance. The groups which seemed to benefit most from the listening aids, suffered most when it was withdrawn.

The evidence in this experiment remains somewhat inconclusive, however, since it is the second experiment of its type and included an attempt to iron out the possible artifacts of the previous experiment, it must be conceded that listening aids of the type employed did not prove to be highly effective.

This raises a larger issue which has been of concern to us for some time. A large number of experiments have now been conducted in listening to time-compressed speech. We have, we think, demonstrated conclusively that exposure to moderately compressed speech will lead to good comprehension with a typical college student population. We have demonstrated that certain schedules of exposure are superior to others and that certain kinds of material lend themselves to compression. However, we have not really begun to identify the basic processes underlying successful listening, or experimented with listener training. We feel that however much a particular listening aid may contribute to listening to specific material, a more important improvement in efficiency might be made in training the listener to use his perceptual and cognitive skills more efficiently for all listening purposes. We believe we have demonstrated the saving in time that can be effected by compressing tape recorded speech. We can present the stimulus more efficiently. We feel the next logical and important step is to train the listener to match this improvement by responding more efficiently. Communication is, after all, at least a two-way process.

Conclusions

The presentation of speech compressed to 375 wpm from 175 wpm for over one hour each day for six days led to significant improvement in comprehension.

Listening scores on the last two passages of the experiment were, however, significantly lower than normal speed comprehension scores.

The use of a precis prior to presentation and a tone (for another group) during presentation to mark important parts of the passage, did not significantly improve performance relative to a control group which did not receive listening aids.

The absence of significant differences between groups held when the groups of this experiment and the previous listening aid experiment (in which a different precis, and a list of key words were used as the listening aids) were compared. There was a tendency for the precis group

in this experiment to improve over the last three passages in which the listening aid was employed. This was counteracted, however, by a consistent drop in performance when the listening aid was removed.

When subjects of both experiments were ranked on their performance on each successive passage presentation, there was significant agreement for each group according to a coefficient of concordance.

The Self-Pacing Study

Introduction

Compressed speech is the result of a technological advance which permits an increase in the rate of presentation of tape recorded speech without pitch distortion. In addition to the obvious advantage of being able to communicate orally in less than the normal time required there is a hidden advantage in that rate of speech then becomes a manipulable variable. One of the major differences between communication by speech and communication by print is that in ordinary circumstances the former is externally-paced while the rate at which the latter is perceived is controlled by the individual recipient. Compressed speech not only permits the speeding of oral input, it also allows the rate of speech to be determined by the individual. The research conducted under this and the previous grant has been aimed chiefly at the determination of the ability of college students to comprehend and to be trained to comprehend compressed speech. Because of the desirability of a larger N, experiments have been conducted in groups. While a group experiment doesn't interfere with the experimenter's freedom to present the stimulus at any rate he chooses, it does prevent him from tailoring that speed to the individual, or from having the individual determine his own most comfortable rate of listening. The experiment described here was designed to examine the variable of self-determination of compressed speech rate. Two questions were asked: (1) At what rate will a listener choose to hear material which is compressed? and (2) In what way will this affect his learning to comprehend compressed speech?

Rationale

Evidence exists to suggest that while listening is the preferred modality for young children, and for adults when the material is relatively simple; reading is preferred for older children and for difficult material (Taylor, 1964). The most common explanation offered is that reading permits a perusal of the material at the reader's own rate, and the difficult portions may be reread. It is clear that time, to absorb information, is crucial here. Listening, while it is an earlier learned skill, and may be considered in one way to be more informative than

reading because it contains intonational nuances, is handicapped as a mode for the communication of densely presented information because the rate at which listening material is presented is externally imposed. It was therefore felt that an important question to be asked about compressed speech is whether an advantage, in fact, lies in the subject's ability to determine his own rate of presentation.

It was hypothesized that the freedom to determine his own rate of listening would provide a more efficient means of communicating to a subject: efficiency to be measured by the subject's ability to answer questions accurately per unit time taken to receive the information.

Additional questions were: What behavior would result from listener controlled speech? How frequently would the rate be changed? What mean rate would be chosen?

Procedures

Subjects. Twelve male college students (four freshmen and eight sophomores) from a local university were recruited for this study. Their ages ranged from 17 to 20 with a mean age of 19.6. All spoke English as their native language and were born in the eastern part of the United States. The average last semester grade for freshmen was B plus in high school; for the sophomores, approximately B minus in college. An audiometric screening test failed to eliminate any subjects on the basis of gross hearing disorder. No subjects had had any training in rapid reading or listening. Subjects were paid $1.50 per hour for participating plus one dollar per session to cover the expenses of carfare. Subjects were informed at the beginning of the study that a bonus of ten dollars would be paid to the best subject at the end of the experiment.

Materials. Listening materials consisted of seven historical passages taken from a college level textbook on English history at the time of colonial settlement. These passages were professionally recorded at 175 words per minute and compressed on the tempo-regulator to 1.5 times that rate. For each passage, a five-option multiple choice test of twenty-five or thirty questions (which had previously been standardized on a similar population) was used to measure listening comprehension.

Subjects were also given a biographical questionnaire and pay vouchers to complete. Texts of the passages were marked at 30 second intervals, when played at normal speed for use by the E in measuring self-pacing behavior.

The equipment consisted of a tempo-regulator, Magnecord tape recorder, Bogen amplifier, two Electro-Voice speakers with ancillary wiring, and a Zenith A-200 audiometer. An unmarked remote control knob was fixed to the tempo-regulator and the visual dial placed in front of the experimenter not visible to the subject. By turning the knobs in the designated direction the rate of output could be made to increase or decrease. The experimenter could record the rate by the position of the pointer on the dial. Stop-watches were used to time durations of equal passage segments.

Design. Each subject was tested individually in a single session, and served as his own control. A baseline passage at normal recording speed (175 wpm) was administered to all subjects at the beginning of the experiment. Three externally-paced (EP) passages were administered by the experimenter at 1.5 times that speed on the tempo-regulator, and three other self-paced (SP) passages were played back on the tempo-regulator, the rate of presentation being controlled by the listener by means of the remote control knob. Following each passage a multiple choice comprehension test was administered. The order of events is outlined in Table 2.

The same passage was used for all subjects as a normal speed baseline measure. The remaining six passages were used in a different order for each of six subjects according to a Latin square design. This was repeated with the next six subjects.

Subjects were told that they would be listening to several tape recorded passages at speeds greater than normal, after which their comprehension would be tested. After the first break subjects were instructed as follows:

"Now you will listen to another tape. On this tape YOU will

Table 2

Experimental Procedures in Order of Presentation

Order	Procedure	Approximate Time Taken in Minutes
1.	Biographical Questionnaire and Pay Voucher	5
2.	Normal Speed Baseline Passage and Test	32
3.	EP Passage at 1.5 Times Normal Speed and Test	23
4.	Audiometric Screening Test During Ten Minute Break	10
5.	SP Passage and Test	23
6.	SP Passage and Test	23
7.	SP Passage and Test	23
8.	Ten Minute Break	10
9.	EP Passage at 1.5 Times Normal Speed and Test	23
10.	EP Passage at 1.5 Times Normal Speed and Test	23

be able to control the speed, like so (experimenter demonstrated the direction of increase and of decrease), without changing the pitch. We want you to listen as rapidly as possible without hurting your comprehension, but you may regulate the speed as you wish. If you find the tape too slow, speed it up. If you have speeded the tape too much, slow it down. I mentioned the bonus to you before. In ascertaining which subject will win the bonus not only will we be taking scores on the comprehension tests into account, but also the greatest speeds with which subjects can listen. You will take a test on this passage as you have on the other passages."

Two experimenters recorded data on the self-pacing behavior. Reading from the dial face which indicated the speed of output, one experimenter recorded the rate every time a marked point in the text was reached. As noted earlier, those points represented thirty second intervals in the passage when played at normal speed. The second experimenter also listened for those same points, but recorded the actual time elapsing between points. Thus data was made available on the rate at the end of each successive period, the overall duration, and the mean rate per segment.

Findings

Subjects were first introduced to compressed speech with a tape which was played at 1.5 times the normal recording speed. Following this three consecutive SP passages were presented.

The lowest (mean) rate used by any subject for an entire passage was 1.16 times normal speed; the highest, 2.05. The overall mean speed at which the twelve subjects chose to play the SP passages was very close to the EP speed. (1.45 x normal as compared with 1.50 x normal). For individual subjects there was no consistent trend from first through the third of the SP passages, in terms of the rate at which they were played. The group means were 1.43 (s.d. = .14), 1.45 (s.d. = .18) and 1.48 (s.d. = .24) x normal, respectively. An examination of rate changes within each passage was made.

The passages were divided into approximately equal quarters. Table 3 shows that the differences between successive passages were smaller than those made between successive quarters within passages.

Table 3

Mean Number of Increases and Decreases
in Speed, Per Quarter* for Self-Paced Passages

Passage Order	Direction	Quarter				All Quarters Combined
		1st	2nd	3rd	4th	
1st	Increase	4.0	2.1	2.2	1.5	2.5
	Decrease	.1	1.0	1.0	1.8	1.0
	No Change	5.9	6.9	6.8	6.8	6.6
2nd	Increase	3.8	2.8	2.5	2.1	2.6
	Decrease	.8	.8	1.2	1.3	1.1
	No Change	5.3	7.0	6.2	6.6	6.3
3rd	Increase	3.9	2.8	1.8	1.8	2.6
	Decrease	.8	.9	1.4	1.2	1.1
	No Change	5.3	6.3	6.8	6.9	6.4
All Passages	Increase	3.9	2.3	2.2	1.8	2.6
	Decrease	.6	.9	1.2	1.4	1.0
	No Change	5.5	6.8	6.6	6.8	6.4

* The mean number of readings taken was 10 per quarter; readings per quarter may not add exactly to 10.0 due to rounding.

There was a tendency for the number of upward changes in rate to decline, while the downward changes increased, as the passage went on. For each quarter approximately ten readings were taken per subject. For all passages combined the mean number of changes per successive quarters were as follows: increases 3.9, 2.3, 2.2, 1.8; decreases 0.6, 0.9, 1.2, and 1.4; no changes 5.5, 6.8, 6.6 and 6.8. (See Table 3). It can be seen that subjects made more upward than downward rate changes. It should be remembered that the speed control knob was set at normal at the beginning of each passage.

Comprehension scores on the six passages in order of presentation are shown in Table 4. The scores, expressed as percentages of the normal speed baseline score for each individual were as follows: 76.3, (EP), 79.9 (SP), 74.8 (SP), 90.0 (SP), 77.2 (EP) and 91.1 (EP). The mean percentage of normal speed scores for EP and for SP were identical: 81.6% of normal speed scores. The externally-paced test scores went from 76 to 77 to 91 percents respectively, while the self-paced test scores went from 80 to 75 to 90 respectively.

Since the mean rates selected on the SP passages were approximately equal to rates of the EP passages, it was decided to combine them in an examination of any overall effect in time. Therefore in addition to the examination of raw scores subjects were ranked according to their performance on each of the six passages (from 1, best, to 6, worst) (See Table 5). One might have expected that ranks would get smaller with order of presentation, however this was not exactly the case. The order used was EP, SP, SP, SP, EP, and EP. The mean successive ranks were 3.8, 3.8, 3.9, 3.0, 3.8, and 2.7. The first two in each series had virtually identical ranks, while on the last SP and last EP passage, performance was distinctly better. Thus performance seemed to improve in time within each series.

Within the three self-paced passages, one trend may be noticed. If the rate of presentation and the extent of comprehension (as measured by percentage of normal speed score correct) are ranked for each subject on each of the self-paced passages, the first shows a significant

Table 4

Time Compressed Listening Comprehension for 12
Subjects under Experimentally (E) and Self-Paced (S) Conditions

Pacer	WPM	Mean Score	Mean % 175 wpm (comp.)	Rate (x175 wpm)	Mean % 175 wpm Duration	Index of Efficiency
E	175	15.7	100.0	1.00	1.00	1.00
E	262	11.6	76.3	1.50	.67	1.14
S	250	12.6	79.9	1.43*	.70	1.14
S	254	11.8	74.8	1.45*	.69	1.08
S	259	13.5	90.0	1.48*	.68	1.32
E	262	12.1	77.2	1.50	.67	1.15
E	262	13.8	91.1	1.50	.67	1.34
$\bar{E}$	262	12.5	81.6	1.45	.67	1.22
$\bar{S}$	254	12.7	81.6	1.50	.69	1.18

* Mean rate for 12 subjects.

Table 5

Rank Order of Performance on Each Passage, by Subject

	Passage					
Subject	262.5wpm	Self-paced	Self-paced	Self-paced	262.5wpm	262.5wpm
1	2	5	3.5	6	3.5	1
2	6	1	2	3	5	4
3	6	2	4	5	3	1
4	5.5	5.5	4	2	3	1
5	2	4	3	1	5	6
6	1	4	6	5	3	2
7	4	5	1	2	6	3
8	5.5	1	3	2	5.5	4
9	4	6	5	3	2	1
10	1	2	6	4.5	4.5	3
11	6	4.5	3	2	1	4.5
12	3	5	6	1	4	2
Σ	46.0	45.0	46.5	36.5	45.5	32.5
$\bar{X}$	3.8	3.8	3.9	3.0	3.8	2.7

negative correlation (Spearman rho) of -.63 ($p<.025$ one tailed); the second, a non-significant negative correlation of -.36, and the third almost zero correlation (-.06). (See Table 6 below). Thus, there is a supposition that rate was less important as a determinant of score by the time the third self-paced passage was presented.

Table 6

Correlation between Rate of Listening and
Extent of Comprehension for Self-Paced Passages

	Self-Paced Passage Order		
	1st	2nd	Third
r	-.63	-.36	-.06
t	2.56	1.24	.20
p	.025	NS	NS
df	11	11	11

Mean performance on the final self-paced and final externally-paced passages was lower than mean normal speed score: Self-paced score was 13.5 and externally-paced, 13.8, as compared with normal mean score of 15.7, and these differences approach statistical significance *t* (SP) = 2.08, *df* = 11, $.10>p>.05$; and *t* (EP) = .190, *df* = 11, $.10>p>.05$). Earlier passages were significantly below the mean, so there is some evidence of learning within the two types of presentation. There is no indication of superiority of one method over the other.

Discussion

The two main purposes of this experiment were to examine behavior of compressed speech listeners under self-pacing conditions, and to determine whether in the prescribed circumstances of this experiment self-pacing proved a superior learning method over externally-paced listening.

Listeners were surprisingly modest in the magnitude of changes of rate they chose to make. The mean rate for each of the three passages was very close to the rate at which they first heard compressed speech 1.5 x normal recording speed: Rates were 1.43, 1.45, and 1.48 respectively, suggesting that a matching phenomenon was taking place.

There was no clearcut difference in performance between self- and externally-paced conditions. It is likely that the flexibility provided by the self-pacing switch was not used to full advantage in this brief experiment. The most probable reason is that the listeners used the rate of the initial compressed passage, which was externally-paced to 1.5 x normal, as a sort of standard from which they chose not to deviate very far. Their behavior during self-pacing exhibited a tendency to take the passage up to higher and higher rates during the first quarter, the ratio of increases to decreases grows smaller with each successive quarter. The number of times there was no change was least in the first quarter, but remains fairly constant during the next three.

The fact that the comprehension of the self-paced passages was not considerably higher than that of the externally-paced passages was somewhat of a surprise to the experimenters. The logic behind their expectations was as follows: Under the self-paced condition, subjects were, of course, free to imitate the externally-paced condition; thus they ought to be able to achieve a minimum degree of comprehension which was at least equivalent to their comprehension under the externally-paced condition. Ideally, then, any changes the subjects made ought to enable them to improve their comprehension beyond this minimum. The data did not suggest that this, in fact, was the case.

Logically, there could be two reasons that this did not happen:

1) Comprehension of speech presented at a constant rate is superior to comprehension of speech presented at a variable rate.
2) Subject control of the speech rate could improve comprehension, but some feature of the experiment prevented this.

The experiment produced no data which could eliminate one of these possibilities, but an ad hoc examination of the experimental situation points out some features which might have impeded comprehension on the self-paced passages, or at least not enabled subjects to use self-pacing to its fullest potential. The following are some of these features.

a) Experimental design: Two of the three externally-paced passages followed the three self-paced passages, thus the subjects had more training when they listened to those two externally-paced passages. It is possible that if some subjects had continued with self-pacing, their comprehension scores on the last two passages would have been higher than the comprehension scores obtained in this experiment. Another possible manipulation of the experimental design would have been to study self-pacing as a method of training subjects to comprehend compressed speech; it is also possible that if some subjects received all passages under externally-paced conditions, that their comprehension scores on the final two passages would have been lower than those obtained in this experiment.

b) Subjects' understanding of the task: Subjects' may have been manipulating the self-paced passages in such a way as to hurt their comprehension, while thinking that they were actually improving comprehension. Since no feedback was given to subjects concerning their performance on the comprehension tests, this is entirely possible. Perhaps telling the subjects of their comprehension scores after each test, would enable them to find a way to use self-pacing more effectively.

c) Self-pacing as an additional task: The mechanics of controlling their own rate was in itself a task which may have interfered with passage comprehension. The subjects may have concentrated to some extent on doing well at controlling the rate while ignoring their primary task of comprehending the material. It would be expected that with more practice,

controlling the rate would require less effort, and thus comprehension on self-paced passages might improve. If this is the case, it might also be expected that if naive subjects were paired so that only one controlled the rate although both listened simultaneously, that early in training, the passive subject might have some advantage over the active (rate-controlling) subject.

Thus experiments should be done (a) to provide more practice in self-pacing, (b) to control the order of self and externally-paced passages, (c) to test the effect of feedback on subject performance and (d) to compare active and passive subjects in a self-pacing situation.

While this experiment provided useful data on the behavior of untrained listeners in self-paced condition, it raised a number of questions that require further attention. Given the state of current technology, self-pacing is of limited practical value since it is not feasible to make available machines for extensive individual use. However, it may be practical to provide a machine for a school library for individual use as an auditory review mechanism for material with which the student is already familiar. This would provide the same flexibility that a reader has in controlling his own rate of reading, with the additional potential advantage of preserving intonational pattern, emphases, and general characteristics of the lecturer's voice. The usefulness of compressed speech as a potential review technique is explored in another experiment.

Conclusion

Performance under self-paced conditions did not differ significantly from performance under externally-paced conditions both with regard to rate of presentation and degree of comprehension.

There was a tendency for subjects to make upward changes more frequently in the earlier part of the passage than later.

Rate of chosen presentation and comprehension score were significantly negatively correlated on the first self-paced passage, showed a negative (but insignificant) correlation on the second self-paced passage, and showed zero correlation on the third.

Both under self-paced and externally-paced conditions comprehension improved with practice, but practice under each of the conditions seemed to be most effective for that condition.

The Standardization of Psychological Test Material

Introduction

During the course of experimentation under this and the previous grant, two types of listening materials have been employed; test material which consisted of edited chapters from a college level textbook on English history; and practice listening materials from pre-recorded popular novels produced by the American Printing House for the Blind (Talking Books). This material was originally recorded at normal recording speed (175 wpm) and then compressed to a variety of speeds ranging from normal to 475 wpm on the tempo-regulator. While this material has served our purposes well in the determination of the feasibility of measuring and improving comprehension of compressed speech; it remains to determine whether our findings will generalize to different, but equally appropriate material of a college level difficulty. For this purpose two disciplines other than history were selected: psychology, described below, and physical geology to be completed at a later date. These two areas of study were chosen because they represent subject matter which makes use of more technical terms but which does not usually rely heavily on the use of mathematics or visual displays in teaching at the undergraduate level and can fairly be treated as connected discourse. While compressed speech may be mixed with other teaching methods for the purposes of our experimentation we chose to treat connected discourse alone. The experiment described below concerns the development of listening material in psychology.

Procedures

Subjects. Fifty male subjects from a local university were employed as subjects for the standardization of the tests on the psychological passages. Of these one failed to complete the experiment and his results were dropped from the analysis. Of the remaining 49 subjects, twenty-two were freshmen, twenty-five were sophomores, and two were juniors. They ranged in age from 18 to 23, with a mean age of 19. Two-thirds of the subjects were born on the east coast.

Their major areas of study were as follows: 20% arts and sciences, 24% pre-law, 14% foreign service, 14% education, 6% pre-medicine, and 6% business. The remaining students were undecided. The average grade received for the last complete semester (high school grade for the freshmen, college grade for the others) was, approximately a B.

Seventy-six per cent of the subjects had had no training in rapid reading. All subjects reported having no hearing difficulties and believed their hearing to be approximately the same in both ears.

Subjects were paid approximately $1.50 per hour. Subjects were informed that bonuses based on performance would be paid to the seven best subjects: the best student to receive a $15 bonus; the second best, a $10 bonus; and the remainder, $5 bonuses.

Nearly all subjects expressed willingness to participate in a compressed speech experiment (those who did not, did in fact participate at a later date). None of the subjects had read or looked through the book used in this experiment; and only one subject had ever taken a psychology course previously. Thirty-five per cent of the subjects were enrolled in a basic psychology course but classes had been in session less than two weeks at the beginning of this experiment.

Materials. The listening material presented consisted of the first eleven chapters of a psychology textbook - Psychology, The Science of Mental Life by George A. Miller.[1] This is an introductory textbook typical of the kind assigned in a basic experimental psychology course. Editing prior to recording was kept to a minimum and was aimed at making equivalent the length and difficulty of the chapters. Having been written by a single author the material characteristics were fairly consistent throughout. Table 7 describes the passage characteristics as they were finally recorded.

Each passage was approximately 3550 words long. There were approximately 165 syllables per hundred words, so that each passage contained about 5800 syllables. The mean number of sentences per passage was approximately 170 with 21.3 words per sentence. Calculations for Reading Ease (according to the Flesch formula) and Listening Grade

---

[1]Miller, George A., Psychology, The Science of Mental Life, Harper & Row New York, 1962, Pp 1-172

Table 7

Characteristics of Psychology Passages as Recorded for Use in Research on Speeded Speech as an Educational Medium

	Chapter												
	1	2	3	4	5	6	7	8	9	10	11	Mean	SD
Total No. of Words	3473	3631	3600	3589	3546	3467	3561	3525	3461	3638	3633	3556.7	64.84
Mean No. Syllables per 100 Words	164.2	169.9	160.9	160.5	164.9	169.3	160.1	161.2	169.7	163.4	165.4	164.5	3.58
Mean No. of Words per Sentence	21.4	20.2	20.2	20.6	24.3	20.2	21.2	19.7	22.0	23.2	21.2	21.3	1.19
Mean No. of Words per Indep. Clause	17.7	17.1	17.8	17.0	18.9	17.3	19.0	17.4	18.7	19.0	18.6	18.0	1.49
Total Time for Recording at Normal Speed in Minutes	21.28	22.33	21.12	22.95	22.50	21.22	21.13	21.70	21.87	23.72	23.08	22.08	.90
Mean No.of Syllables per Minute on Normal Speed Recording	268.00	276.31	274.34	251.02	259.96	276.63	269.76	261.89	268.50	250.59	260.36	265.21	8.94
Mean Deviation From 262 Syllables per Minute	6.00	14.31	12.34	-10.08	-2.04	14.63	7.76	-.11	6.50	-11.41	-1.64	3.30	8.68

according to Rogers formula, were not performed because of the essential inapplicability of such measures to college level technical material.

A comparison of the passages taken from the psychology book with those passages previously used from the textbook on English history shows the following differences: Passages are approximately 3700 words long. There are approximately 144 syllables per hundred words so that each passage contains 5300 syllables. There are about 19 words per sentence.

Probably the most crucial difference between the two types of material used is the syllable to word ratio which is greater for the psychological material. This means, in essence, that there is a greater proportion of multi-syllable words used in the passage.

The psychology passages were recorded on magnetic tape at normal recording speed. To make the speed of presentation comparable to previous material the standard employed was designated in syllables per minute, rather than words per minute. The reason for this is as follows: The time taken to produce a given speech sound is fairly constant over individuals. Variation in rate of speech is largely due to differences in duration between words. (Goldman-Eisler, 1956) However that only holds true if different speakers speak the same words. If words of different syllable length are employed, (two-syllable words vs.one-syllable words, e.g.) the duration will be directly related to the number of syllables spoken, a more natural unit of speech. Thus in keeping constant the rate of speech production so that the psychology material will be comparable to the historical material, it was decided to match them on the basis of rate of syllable production. Both sets of materials have been recorded at a rate of approximately 262 syllables per minute. Since the ratio of syllables to words differs in the two types of material, the rate of words per minute is different. The fact that the syllable to word ratio differs is a natural consequence of different vocabularies employed in the two disciplines. That difference is one which is relevant to a comparison of the feasibility of using the material for compression.

For each of the recorded passages tests were constructed which contained 40 to 45 five-option multiple choice questions.[1] These questions were of the factual, interpretative, and evaluative type. The test booklets were put on stencil and reproduced in the same form used in previous standardization measures, except that in this case a separate answer sheet was provided.

In addition to the above materials, biographical data sheets, pay vouchers, and a list of debriefing questions at the conclusion of the experiment, were presented to all the subjects for completion. Pencils were provided.

The equipment used consisted of a Magnecord tape recorder, amplifier, and speaker with ancillary wiring. The tapes were presented free field in a large classroom with good acoustics.

Design. The subjects were tested as a single group one evening and the next morning. In the first session, after completion of the biographical questionnaires and the pay vouchers subjects were told that they would be presented with tape-recorded material taken from a psychology textbook to which they were to listen closely, and that tests on each passage would be administered at its conclusion. Subjects were informed of the bonuses to be awarded, and the duration of the experiment.

The first session consisted of five passages each followed by a test. The second session consisted of the remaining six passages and tests. The material was presented in the smae order in which it appeared in the book. Breaks were provided in the middle of each session.

---

[1]Some of these questions were adpated from those printed in the Instructor's Manual to Accompany Psychology, The Science of Mental Life by George A. Miller. Prepared by George A.Miller and Cynthia Norris, Harper and Row, New York, 1964

Data Analysis

Responses were key-punched and used in a score test routine which was run on a modified Harvard Graduate School of Education "Multivariate Statistical Analyzer". Each subject item was scored right or wrong. For each item, the item difficulty and the biserial correlation of the item with the subtest total score was calculated. Tallies of option choices for each item were provided. Subtest mean, standard deviations, and Kuder-Richardson reliability coefficients were calculated. After the item selection was completed for the final battery, the above was rerun for the selected items.

The following criteria were used in standardizing the tests: Items with a biserial r of less than .15 were discarded. Items which were answered correctly by more than 95% of the subjects or less than 15% were discarded. A 60% mean level of difficulty was the goal. Additional items were then discarded with that in mind until the eleven passages had similar median frequency distributions of item difficulties. In achieving this result each test was left with twenty-eight of the original forty to forty-five items. The biserial r's and Kuder-Richardson reliability coefficients were then recomputed. (See Table 8 and Appendixes B1 and B2 for data).

The newly constituted tests were then typed on stencil and reproduced for use.

Summary

Eleven passages of a length similar to previously used historical material were selected and recorded from an introductory textbook on psychology. These passages were presented at normal speed to a group of 49 college students in two sessions. For each of the passages 40-45 item multiple choice tests had been constructed and were administered at the conclusion of each playback. Biserial r's, and item difficulty were computed along with overall test reliabilities. The tests were reduced to 28 items each with similar difficulty and reliability characteristics, and characteristics which were similar to the previously used material. This test standardization was done for the purpose of using the new material in a later experiment to compare psychological with historical material with respect to their feasibility for use in compressed speech presentations.

Table 8

Characteristics of Tests as Standardized on a College Population

	Chapter										
	1	2	3	4	5	6	7	8	9	10	11
Mean Number of Items Correct out of 28	17.4	17.5	16.6	15.8	17.4	14.9	16.8	16.1	17.2	15.6	17.0
SD	4.8	4.7	4.5	4.4	4.6	4.8	4.2	4.4	5.0	4.7	4.0
Kuder-Richardson Reliability	.78	.79	.75	.74	.77	.76	.72	.77	.81	.76	.74

The Use of Compressed Speech as a Review Technique

Introduction

Previous research conducted under this grant has established the feasibility of improving the comprehension of compressed speech with practice. The material used has been college level textbook chapters and the subject population fairly representative college students. It is natural now to explore the ways this may best be used for educational purposes. One major potential use is as a supplement to the college lecturer in the presentation of new material. Our laboratory research to date has suggested that this use is entirely feasible.

Another way in which compression may prove of value in this setting is as a technique whereby the student may review familiar material. There are some inherent advantages in repeated oral presentation as opposed to visual display; chiefly the preservation of intonational patterns, emphases, meaningful pauses, etc. The preservation of those characteristics combined with rapid presentation could be beneficial in a review situation. Thus the need for an experiment testing the efficiency of compressed speech as a review technique was indicated. The following experiment investigates the use of speech compression to present familiar material, to untrained listeners.

Rationale

One of the major findings of previous research conducted under this grant is that exposure to compressed speech improves performance on new material presented at that speed. The degree of improvement resulting from practice is considerably greater when the same material is presented again (see Progress Report #2, January 1966). In one experiment mean score rose from 60% of normal score on the first administration of a passage at 375 wpm to 98% on the second one, when it was administered immediately afterward. For these reasons it was felt that the presentation of the same passage after a considerable

interval of time might provide an adequate review. This was examined with a group of untrained listeners. The group was split into two matched halves, one of which reviewed by compressed speech the other by reading.

Procedures

Subjects. The subjects used in this study were drawn from the population on which the Miller psychology book tests were standardized. Of the forty-nine students who participated in that experiment, twenty-two subjects agreed to return. Of these, half were freshmen and half sophomores, with an age range from 18 to 20.5, mean age 19.0. Their general characteristics were similar to the larger group from which they were drawn, described earlier, except that their average grade for the previous semester was approximately B plus, the larger group having averaged a B. Hearing was considered normal by the subjects, about a quarter had had rapid reading training, none had experienced rapid or compressed speech.

Subjects were paid approximately $1.50 per hour. They were told that they would be divided into two groups, one member of each group to receive a ten dollar bonus based on performance.

Materials. The listening material in this experiment consisted of the first four chapters of the psychology text previously presented in the Standardization Study. These tapes were compressed on the tempo-regulator to speeds of approximately 524 syllables per minute from a normal recording speed of approximately 262 syllables per minute. The subjects listened to no other material. One group heard these tapes. The other group was presented with typewritten copies of the text of each of the four passages. All subjects received the same tests. The tests used were the revised versions of the tests used in the Standardization Study. These tests each had twenty-eight five-option multiple choice items. An answer sheet was used along with them. At the end of the experiment the listening group was presented with two debriefing questions concerning possible changes in their listening comprehension and their preferences for mode of review.

The equipment used consisted of a Magnecord tape recorder, and amplifier and speaker with ancillary wiring. Pencils were supplied to the subjects.

Design. The main purpose of this study was to examine the use of compressed speech as a reviewing technique with naive subjects, and compare it with the conventional method of reviewing (reading). For this purpose the returning subjects, all of whom had been exposed to the material at normal speed seven weeks before, were divided into two matched groups based on their original scores on the four passages. The subjects were given a brief introduction explaining that they would be divided into two groups, one of which would read the material they had heard last time, while the other group would listen to it at high speed in another room. All were informed that they would be tested on this material immediately following review. Subjects in the reading group were encouraged to review from the printed passage in whatever way they chose for the same duration of time as the tapes were played to the other group. The listening group was not allowed to take notes.

The four passages were presented in the following way: The first and third passages were presented twice in succession; the second and fourth were presented once each. Passages one and three were presented twice, in order to provide practice for these untrained listeners. Thus the experimental design afforded two comparisons: between the reading and listening groups, and between single and double durations of exposure.

Findings. Mean scores for the two groups are presented in Table 9.

The reading group was significantly better than the listening group overall as determined by a two-factor analysis of variance $F = 16.5745$ (df, 1,20; $p < .01$.) The interaction between groups and different tests was statistically significant: $F(3,60) = 3.5645$ (df, 3,60; $p < .05$.)

Examining performance on the double presentation separately from the single presentation of passages, the following conclusions may be drawn. Performance on the second double presentation for the listening group showed no change, that for the reading group showed a significant decline ($t = 2.35$, $p < .025$). There were no differences between the scores on first and second single presentations.

Table 9

Mean Scores on Passage Tests
by Group

	Tests in Order of Presentation				
	Unrevised Tests Normal Speed	Revised Tests, 375 wpm*			
Passage	1-4	1	2	3	4
Listening Group	19.8	11.2	10.7	13.0	12.1
Reading Group	20.7	21.2	17.1	18.4	17.3

*Listening group heard passages presented at 375 wpm while reading group read passages for same length of time.

Differences between double presentation (in the case of the reading group this really means twice as much time available to review) and single presentation were not significant for the listening group, but the reading group performed significantly better with twice the time to review ($t = 3.40$, $p < .005$).

Discussion. Familiarity with the material was not sufficient to overcome the handicap of lack of training in compressed speech comprehension. In this experiment it appeared that reading was a superior review technique. It should be noted that although the subjects had heard the material once, seven weeks had elapsed before its presentation again as compressed speech, and unlike a typical college course, during that period the subjects had no exposure to related material. The fact that the listening group benefited less from double presentation that the reading group (which had twice the time) may be a result of a lack of comprehension of the speeded material on the initial presentation. It can be seen that on the second double presentation (third passage) listening group results were better than for single presentations. This suggests that with more training double presentation may prove of greater value.

Seven of the eleven subjects in the listening group reported that their listening comprehension had improved during the course of the experiment. Although seven of the eleven said that they preferred reading for review within a limited time space, the remaining four all said that they would prefer compressed (not normal speed!) speech as a review medium.

Listening Aid Study II Extension

Background:

This experiment was designed to provide information on two questions: Can a trained subject retain his ability to comprehend compressed speech? And, to what extent is compressed speech useful as a method of reviewing familiar material, relative to reviewing by reading?

The problem of retention of skill is potentially important if compressed speech is to be used at regular, but widely separated intervals, in the educational setting. Previous experimentation (e.g. Listening Aid Studies I and II) have demonstrated that with five or six hours of practice listening, comprehension approaching normal can be achieved at a rate of 375 wpm or more than double that at which the material was originally recorded (175 wpm). However it remains to be seen whether that listening ability can be maintained or more rapidly relearned. Previous research conducted under this grant has indicated that while the content of what has been learned via compressed speech is retained as well as that learned at a normal rate, the skill quickly disappears. (See Progress Report No.2, January, 1966).

In the first retention study experimental and control subjects who had been tested in the spring, were called back six months later. While both groups showed significant loss in retention of the content over that length of time they did not differ significantly from each other. In that experiment subjects were also given a new passage at 425 wpm to measure retention of skill. Experimental subjects declined 22% and control subjects 12%, amounts which were significantly different from the test scores at that speed at the end of the original experiment.

In a second experiment, subjects who had been exposed to normal speed passages for purposes of test standardization, and one 425 wpm passage (without prior training) were called back one month later. They were retested on the normal speed tests (without passages) and were given a new passage at 425 wpm. The losses in content at normal speed were about 40% (60% of original scores were achieved). At 425 wpm on the new passage

there was a drop in comprehension of about 9%, however the scores were so low to begin with that the drop is not too meaningful. An additional new passage was presented at 325 wpm but owing to artifactual noise, produced no interpretable data.

A third experiment was run in which trained listeners were recalled one month after training. All the tests they had on passages presented at speeds ranging from 175 to 475 wpm were readministered (without passage presentation). On the 425 and 475 tests no loss of content appeared. On the remaining passages (175-375 wpm) about 70% of the content was retained. On the new 425 wpm passage mean scores dropped 14%, however they were at a level which was not different from naive subjects tested at that speed (in the previous retention study) so that one cannot say skill was retained. On the new passage at 325 wpm a drop of 11% occurred, however again, their mean scores were not much better than a naive group at that speed so again little evidence of retention of listening skill is apparent.

Thus prior evidence suggests that while retention of content of material presented at high speed in general compares favorably with material presented at normal speed, retention of skill is not usual.

In the experiment described below, an attempt was made to examine the retention of skill and the usefulness of compressed speech for review purposes by a group of trained listeners. These listeners are those who were trained in the second Listening Aid Study described earlier in this report.

Procedures:

Subjects. The subjects were twenty volunteers, all participants in the second Listening Aid Study. All were trained listeners, who had received 6 hours of rapid listening practice (375 wpm) during the Listening Aid Study. All subjects in the Listening Aid Study were asked to return; the characteristics of the subjects who returned did not differ significantly from those of the entire group, (see Listening Aid Study subjects); the subjects returning were those who were available on the afternoon chosen for this study.

Materials. The listening materials used in this study consisted of the same four tape recorded psychology passages used in the Review Study with naive listeners. These passages were compressed to a rate of approximately 524 syllables per minute. Two of these passages were the psychology passages played at normal speed for these subjects during the Listening Aid II Study (passages M-1 and M-2); typewritten copies of those two passages were also used.

The equipment consisted of a Magnecord tape recorder, Bogen amplifier, Electro-Voice speaker and ancillary wiring.

Method. The experiment took place 3 weeks after the last day of the listening Aid Study. It will be recalled that at the outset of the Listening Aid Study, all subjects listened to two passages of psychological material, at normal speed (262 syllables per minute); immediately following each of those passages, subjects had been given an appropriate comprehension test for that passage, the unstandardized version. Subjects were given two scores on those tests: a) A score on the total test including those items which were subsequently discarded for purposes of standardization b) a score on only those items which comprised the standardized version of that test.

Subjects were divided into two groups for this experiment, on the basis of their mean total scores on the two psychology passages given in the Listening Aid Study. One group was designated the "reading group" and the other the "listening group".

A total of four passages were presented to the subjects The first two were presented to test the retention of the skill of high speed listening. All subjects were given the same treatment. On the last two passages, subjects in the reading group read the passages, while subjects in the other, the listening group listened to the passages.

The first two passages to be presented were the 3rd and 4th chapters from the same psychology book as those psychology passages administered in the Listening Aid Study. They were presented at 524 syllables per minute. After each of these two chapters, the standardized test for that chapter was given.

A ten minute break was then given, following which the two groups were placed in separate laboratories. The two psychology passages administered then were the same passages administered at the outset of the Listening Aid Study. After each passage, the standardized test for that chapter was administered. In one laboratory, the reading group read each of these two chapters. They were supplied with pencils and allowed to review the material as they wished. The amount of time allowed for review was the same as that given to the listening group for listening. The listening group listened to both passages at 524 syllables per minute. The first passage (M-1) was played twice. The second passage (M-2) was played once. The listening group was not allowed to take notes while they listened. They were given the same tests as the reading group after each passage.

Findings:

In order to compare results on the first two passages presented to measure retention of skill (M-3 and M-4), with earlier performance, scores on these tests were compared with scores on the normal speed original presentations of M-1 and M-2 after those test scores had been recalculated after standardization had eliminated items. Thus scores on tests of equal length and approximately equal difficulty were compared. This unconventional look at the data is solely for purposes of tentative hypothesis development and must not be considered a legitimate statistical technique for data analysis. The per cent of normal speed performance was obtained by dividing the M-3 and M-4 scores into the mean normal speed scores. (See Table 10) In the same way, scores on the M-1 and M-2 passages in this study were divided by scores on the standardized versions of those tests.

On this basis the listening group performed at 73.5 and 77.2 per cent of normal scores on new material, while the reading group had scores of 88.8% and 98.3%. These tests were presented three weeks after the earlier experiment had been concluded. When the scores are compared with results on the final test presented in that study (passage C-4 presented without any listening aids) at approximately the same speed, there is no decline in performance for either the listening or reading group. Scores on that test were 68.4 and 90.1 for the two groups respectively. The data also

Table 10

Mean Scores and Per Cent of Normal Speed Scores
of Trained Listeners on New and Familiar Material
Presented at Two Times Normal Speed

	Listening Aid Study Extension			
	New Material		Familiar Material	
	M-3[a]	M-4[a]	M-1[b]	M-2[c]
Listening Group (N=10)				
Scores, Corrected for Guessing	9.52	9.70	13.18	9.65
Percentages of Normal Speed Score	73.52	77.22	103.41	82.91
Reading Group (N=10)				
Scores, Corrected for Guessing	11.12	10.88	16.90	13.22
Percentages of Normal Speed Scores	88.83	98.32	143.60	123.14

[a]Per cent of M-1 and M-2 at normal speed, standardized items only.

[b]Per cent of M-1 at normal speed, standardized items only.

[c]Per cent of M-2 at normal speed, standardized items only.

suggests that performance improved when the second passage (M-4) was presented in this study.

When passages M-1 and M-2 were presented to the current group the listening group (which heard M-1 twice, and M-2 once) performed at 103% of normal score on M-1, and 83% on M-2, while the reading group (which was given equivalent time to review by reading) performed at 144% on M-1 and 123% on M-2. The double time condition added approximately 20 percentage points to each groups score. The reading group on this measure of reviewing performance was superior to the listening group.

Discussion:

This experiment, while providing some interesting results, must be considered as no more than a first cut at an examination of the ability of trained subjects to review by means of compressed speech. There are a number of problems in interpreting this data which were anticipated, but it was felt that with little additional expenditure of time and money this adjunct to the second Listening Aid Study was worth doing. Retention of skill was measured against performance on earlier tests in the same subject matter but those tests had been presented prior to standardization. It was also compared with different subject matter at high speed (Passage C-4) presented at the end of the Listening Aid Study. An examination of those scores shows that the reading group in the study was superior on that material, although the two groups were equivalent on the same subject matter presented at normal speed.

With the above reservations, it may be noted that performance on new material after a three week lapse, wasn't bad, the second test presented showed some improvement. Double exposure at high speed to familiar material provided scores better than the original. Single exposure showed some loss for the listening group, a better performance for the reading group. Since the tests were re-presented as well as the passages, however, a condition in which new tests are used with the same material might provide a more telling result. It should also be noted, that while the subjects of this experiment were trained in listening to compressed speech, they had no training in using it as a reviewing technique. It is possible that the novelty of that

situation may detract somewhat from the potential benefits that might accrue from reviewing with compressed speech by trained listeners. We feel that further investigation of this possibility is called for.

Overall Summary

This project report describes the most recent research in a series of experiments begun under a grant from the New Educational Media Branch of the United States Office of Education in 1963, and continued through a second grant awarded in 1965. The research reported here covers a wide gamut of topics; the use of a precis as a listening aid to comprehension of compressed speech, the use of pure tone as an aid in signifying important parts of a passage, the efficacy of compressed speech to be paced by the listener, the ability of trained subjects to retain the listening skill they have acquired after a three week lapse, and the potentialities of compressed speech as a review technique for naive and for trained listeners.

Two of the major findings of previous research were reaffirmed: Exposure to compressed speech will improve comprehension of new compressed material; in general subjects find material presented at more than double normal recorded speed an acceptable way to listen. The listening aids employed in the study in this report were no more helpful than those used in an earlier study. While all groups of subjects improved over time, there was no difference between groups without aids, and those with, in terms of overall comprehension. An examination of self-pacing behavior showed no difference from performance under externally-paced conditions, both with regard to the chosen rate of presentation and ability to comprehend the material. However this was a new technique for the listeners and it is felt that the more extensive use of this technique in an experiment might provide richer results. The experiments reported here on the feasibility of using compressed speech as a review technique show that both for naive and trained listeners reading for the same amount of time provided superior results. However, the gap between reading and listening groups was greater for the untrained than for the trained listeners. The latter group was not tested under ideal conditions, however it was decided to take a first cut at the problem. The results are such that a more

intensive study of reviewing by trained listeners is desirable. The retention of skill by this group shows some promise that skills do not fade rapidly, and that rapid improvement in performance can be effected with some additional exposure.

One major question remains to be examined under this grant: The feasibility of compressing different types of material for presentation to college students. The groundwork has been laid for a comparison of the comprehension of college level material in the fields of history, psychology, and physical geology, which will be described in the next report.

References

Goldman-Eisler, Frieda. The determinants of the rate of speech output and their mutual relations. J. Psychosomatic Research, 1956, I, 137-143.

Taylor, S. E. Listening. Washington, D. C.: National Education Association, 1964.

APPENDIX A

C-7

The Inns of Court and the Lawyers

Precis

The author is most concerned with the type of lawyer called to the bar and practicing before the King. This particular lawyer might have had any one of several backgrounds.

The training for law took place in "The Third University of England." The establishment of the Inns of Court as an institution in England occurred several centuries ago. Special names were given to the students of law depending on the number of years they had been at the Inns of Court. The author also defines the term "ordinaries."

There was no formal examination at the Inns of Court but the author does mention a situation in which the excellence of legal training is proved. As part of university life, lectures were given by certain lawyers, and on occasion students presented the plays of a favorite playwright.

Certain English institutions evoked the sympathies of the students -- others their criticism. This criticism illustrates the students' prevalent interest. It also influenced the attitude of the King toward lawyers.

The author tells us what proportion of the students left the Inns of Court and returned to their homes to find other jobs. Those who did finish had to establish practices. The author mentions several ways that a lawyer could go about this, as well as the requirements for being admitted to the bar.

One classification of lawyers was discussed briefly since little was known about it, but it was known that most of their clients were landed gentry.

In one of the English counties, dynasties of lawyers can be traced. The author's final statement sums up his impressions of legal training.

Selection C-7

The Inns of Court and the Lawyers

Directions: Read each question carefully and choose the best answer. On the line at the left of the question number place the letter corresponding to the answer you chose. Work quickly but accurately. You may answer a question even if you are not entirely sure of the answer, but do not guess wildly, since you will be penalized for wrong answers.

_____1. Of the following groups, least is known concerning

a. Readers.
b. London lawyers.
c. judges.
d. Utter Barristers.
e. country lawyers

_____2. "The third university of England" was comprised of

a. Lincoln's Inn and Gray's Inn.
b. Inner Temple and Middle Temple.
c. the Inns of Chancery.
d. the Inns of Court.
e. the Inns of Court and the Inns of Chancery.

_____3. At the Inns of Court, lectures were given primarily by

a. Judges.
b. Readers.
c. Serjeants-at-Law.
d. Mootmen.
e. Inner Barristers.

_____4. The Inns of Court were already an established institution by the

a. fourteenth century.
b. fifteenth century.
c. sixteenth century.
d. seventeenth century.
e. eighteenth century.

_____5. Of the following, the barrister was least likely to have a father who was a

a. member of the landed gentry.
b. barrister.
c. solicitor.
d. merchant.
e. physician.

_____6. A county known for its dynasties of lawyers was

a. Devonshire.
b. Hampshire.
c. Gloucestershire.
d. Warwickshire.
e. Shropshire.

_____7. During their first two years at the Inns of Court, students were referred to as

a. undergraduates.
b. Readers
c. candidates of law.
d. apprentice attorneys.
e. Clerks Commoners

_____8. One aspect of the lawyers's life not described in detail by the author is his

a. background and origins.
b. courtroom manner.
c. school training.
d. obtaining a practice.
e. clientele.

_____9. A playwright who was a special favorite of the lawyers was

a. Johnson.
b. Shakespeare.
c. Moliere.
d. Bacon.
e. Goethe.

_____10. Admission to the bar was based on

a. an oral examination.
b. completing a fixed number of courses.
c. serving a specified apprenticeship.
d. a general estimate of qualifications.
e. payment of a fixed fee after the required years of study.

_____11. Among the means of increasing legal practice, the author indicates that lawyers used all of the following except

a. taking part in a "cause célèbre".
b. publicity within the legal profession.
c. making famous arguments in Parliament.
d. working for more successful lawyers.
e. offering the use of a large memory.

_____12. According to the author, the training received by a lawyer led to

a. a superficial and unintellectual view of life.
b. intellectual honesty and honesty of conduct.
c. an overemphasis on material gains and comfort.
d. unscrupulousness and dishonesty in business dealings.
e. loyalty to clients and self-sacrifice.

_____13. Those who could practice before the King's courts were called

a. attorneys.
b. professors of law.
c. Readers.
d. barristers.
e. benchers.

_____14. Which of the following were called to the bar?

a. Solicitors
b. Barristers
c. Attorneys
d. Justices of the peace
e. All of the above.

_____15. Students of law who did not become barristers entered other professions. One such profession <u>not</u> mentioned is

a. Member of Parliament.
b. justice of the peace.
c. undersheriff.
d. deputy lieutenant.
e. Serjeant-at-Law.

_____16. The number of Inns of Court was

a. two
b. three.
c. four.
d. five.
e. ten.

_____17. The major part of the author's comments is given to a description of the lawyer's

a. training.
b. professional life.
c. courtroom behavior.
d. achievements.
e. social mores.

_____18. The majority of students at the Inns of Court

a. eventually became barristers.
b. became members of Parliament.
c. left before passing the bar.
d. also studied abroad.
e. eventually became judges.

_____19. The sympathies of lawyers were likely to be with all of the following <u>except</u>

a. Puritanism.
b. Parliament.
c. the monarch.
d. common law.
e. the judges.

____20. The term "ordinaries" referred to

a. living quarters for students outside an Inn of Court.
b. trials pleaded without benefit of a lawyer.
c. students enrolled for only two years at the Inns of Court.
d. clients who did not own any land.
e. briefs prepared by lawyers in civil cases.

_____21. Criticism of James I by students is cited by the author as evidence for

a. the existence of academic freedom.
b. lack of refinement among students.
c. general low esteem of this monarch.
d. insurrection among law school faculties.
e. student interest in politics.

_____22. Prior to becoming Utter Barristers, the lawyers in training were known as

a. Readers.
b. Bailiffs.
c. Mootmen.
d. Clerks Commoners.
e. pleaders.

_____23. The attitude of the monarch toward lawyers of the time is best described as

a. antagonistic.
b. friendly.
c. anxious.
d. materially benevolent.
e. interfering.

_____24. The author cites the debates in the House of Commons as evidence of

a. the quality of legal training.
b. the decline of legislative honesty.
c. loopholes existing in the law.
d. the power of the Law.
e. the need for more legal training.

_____25. Clients for lawyers practicing outside London came primarily from

a. landed families.
b. landed and commercial families.
c. yeomen and tradesmen.
d. nobility.
e. a fair cross section of the population.

In 30 seconds Selection C-7 begins...

The Inns of Court and the Lawyers

From late colonial days to the present the lawyer has played a leading role in the life of the United States. He had no less a role in the England of the days before the colonists crossed the Atlantic. He had many functions, but above all he was the right-hand man of the country gentleman, preserving the titles of his land for him. His value was recognized: presents of venison arrived at his office in Chancery Lane; and when he came to the country, he was treated with due observance.

Among lawyers the barrister is the one with whom we are most concerned. He was one who after long residence in one of the Inns of Court had been called to the bar, and he alone could practice before the King's courts. But there were also attorneys and solicitors who prepared cases for barristers and who practiced before minor courts.

The barristers were, many of them, younger sons of the gentry and occasionally eldest sons. They were also sons of barristers, of attorneys and solicitors, merchants, and well-to-do businessmen, and occasionally the sons of clergymen or physicians. There were instances where even a yeoman's son was able to afford the expense of the long training at the Inns and to qualify for the bar.

The training was at one of the four Inns of Court; Lincoln's Inn, the Inner Temple, the Middle Temple, and Gray's Inn. Those Inns together with the Inns of Chancery made up something like a university. It was "The third university of England" and by the sixteenth century was already an established and characteristic English institution. It served the profession of law, but it was thought of also as a training ground for the sons of the nobility and

the gentry and for those entering the service of the commonwealth. When the American colonists in the eighteenth century wished to give their sons advantages, they sent them to one of the Inns of Court.

For all their importance the Inns were not corporate bodies. They developed no set laws but ruled by custom. They were not connected in any way with the state, and yet they had complete control over the education of the men who carried on the law. Each of the Inns had a governing body. That body was self-perpetuating, and consisted of established men in the law, who decided questions of allotment of rooms, instruction, the conduct of members, promotions in rank, and, above all, finance.

The students were supposed to live within the Inn, two in a chamber. Not all of them could be accommodated within the quadrangles; some lived at "ordinaries" outside, and awaited their turn to find rooms, or stayed outside for more freedom. Every student was supposed to partake of Commons or meals for a certain fraction of the year--from eight weeks to three months. Dinners were at noon and supper at six or seven o'clock. In hall the students were not allowed to wear hats, though caps were permitted, nor were they to appear booted or spurred or carrying swords.

A student coming to London for legal training might enroll for two years at one of the Inns of Chancery, and then go home to be a justice of the peace. Or he might proceed straight to one of the four Inns of Court. By the seventeenth century many men were going directly to the Inns of Court. If they did so, they had, during the first two years, few fixed exercises, but were supposed to do much reading and talking of law; they were called Clerks Commoners. After two years they became Mootmen or Inner Barristers. In five or six more

years if they were fortunate enough to be called to the bar at the end of that time, they became Utter Barristers. The Inns were sometimes limited in the number of Utter Barristers they could name in a single year, and did not by any means choose all who had spent the required period. There was no formal examination, and there was not always a fixed number of exercises to be completed. The education was rather a flexible one, and the admission to the bar must have been based upon a general estimate of a man's qualifications.

An Utter Barrister had not completed his training. For at least three more years and sometimes for four or five, he had to perform exercises and to assist in directing the studies of the younger men. In theory he could not plead before the general courts at Westminster until those years had elapsed, though in reality he sometimes did. In most instances he carried on law work in the offices of other men and probably prepared cases for them.

The details of the schemes of education differed much from Inn to Inn. There were moots, bolts, imparlances, putting cases, and readings. The moots were most important. Students were given topics in advance on which to prepare a pleading. Two men, sometimes one of them younger and one further along, were assigned to argue an issue. Their arguments were then criticized by older men, by Readers and Benchers, perhaps by a Serjeant-at-Law, or by a great judge who happened to be in residence. In some moots men had to plead extemporaneously; in others the student was required to recite the pleading from memory; in still others the pleadings were given in law French, which the student had to turn at once into English. Putting a case was a less formal procedure. As men were at dinner or supper one of the older men might put a case and question all those at the table as to what action should be taken and what pleading used.

Young men walking about the quadrangles were encouraged to put cases to one another, and those who were skillful became known as put-case men. Law, said one Serjeant-at-Law was a babblative art; men should study all morning and talk all afternoon. Freedom to walk about and discuss the law was considered so important that a plan for a new building in one of the Inns was opposed because it would cut down the walking space and so interfere with put-case men.

The most formal element in the education was the lectures given by the Readers. A Reader would be allowed half a year in which to prepare his lectures and then would give them over a period of weeks or days. The lectures would be devoted to the exposition of a statute, or more often to a series of statutes, explaining why the statutes had been passed, at what abuse they were aimed, and how they differed from earlier legislation. Before he was done the Reader would point out vague phrases in the statutes and indicate the ways in which those phrases might be interpreted.

It was a long training and men who had gone through it with attention and purpose must have been as thoroughly trained as anyone in England. Law schools, said the historian Maitland, make tough law. One can see the effects as one scans the reports of the great judges. The debates in the House of Commons, where many members were old Inns-of-Court men, prove how good the training was. There were men who could gather together the arguments made in the House over a period of several weeks, point out the holes in each argument, and then go straight to the root of the matter. They knew exactly how to phrase a proposed bill so that it was perfectly clear.

It was the hope of wise old lawyers that the training in the Inns made not only for precision but for breadth of view. They urged the students to

study history, and English history in particular, and to make themselves familiar with languages. Some of the best lawyers and judges were men of broad scope. They had the wisdom that comes with experience of human behavior, and that accumulates when good minds apply themselves to what other good minds have set down in print.

Unfortunately the training was less rigorous in the early seventeenth century than it had been earlier, or so observers thought. It was noticed that attendance at the various exercises was becoming less regular. Young men found that by paying fines they could avoid the preparation of moots, and they were not always discouraged by those in authority who liked to see the funds of the Inn increase. It was said further that Utter Barristers and Readers were neglecting their duties. In this charge there was probably truth. From the last half of Elizabeth's reign there had been an enormous increase in the numbers of students, and especially of those who came to enjoy themselves. Where students intent on matters other than their studies flock in, standards deteriorate, and even teachers lose interest. Moreover, any formalized system of education tends to lose its initial impulse.

The Inns had much to offer besides moots. They were like clubs, which men joined because their fathers had belonged. A young man not only met youths of his own kind but was thrown easily and naturally into contact with great lawyers and judges, and sometimes with national figures. Whether he learned law or not, and he could hardly escape absorbing a little, he caught the tempo of his time and breathed the air of a great center.

He might frequent Paul's Walk and hear gossip of the court and of Parliament and of what was happening in Germany. In his own Inn he was likely to hear about

politics. In an unpublished diary of a student in Gray's Inn is evidence that the students talked public affairs and were critical of James I. If the young man listened to older men in the Inns, he would have heard much against royalty. James was said to have told the lawyers that he would quit the hunting of hares and hunt them. The lawyers resented his statements about them, his attacks on the law, and his bullying of the judges. Many of them favored Parliament as against the King, and were likely also to have puritan sympathies. Not all the young men would have agreed with such lawyers, but we may be sure they would have discussed the questions. They were studying the common law, and it was under fire.

The students had more frivolous interests. They thought the Christmas season, which lasted twelve days, demanded gaiety. Some of the gaiety was frowned on as unseemly, but a certain amount of decorous festivity was often provided for. At dinner the great meat dish would be brought in with state and music and much bowing. Then would come the singing of hymns and carols, and the Master of Revels would sing and call on others to join him. Dancing might follow and a Lord Chancellor might lead off with a few steps. All this was fun for the young men, and so were the celebrations when a Reader was appointed or a Reader became a Serjeant-at-Law. There would be a procession and perhaps a feast. Not infrequently the students were allowed a play. Shakespeare's Twelfth Night and the Comedy of Errors were special favorites and were frequently played in the various Inns.

The students flocked to the theaters. At the foot of the Temples one could take a boat across to the playhouses on the Southwark side. That Inns-of-Court men and playwrights and actors consorted together has been

abundantly proved. Shakespeare's plays are full of allusions to the law and to the men who studied law. It will be remembered that Falstaff had been to Clement's Inn (an Inn of Chancery) and there are references to others.

Most of the Inns of Court men never became barristers. After a year or two they went home to become justices of the peace, undersheriffs, deputy lieutenants, and possibly members of Parliament. But the Inns had left a stamp upon them.

The best men usually took up practice. How did they set out to gain a practice? They might continue at the Inn, moving up from Utter Barrister to Reader. A successful Reader might hope to become a Serjeant-at-Law, and so be on his way to a judgeship. The ladder of promotion for those who had made a brilliant record at one of the Inns was a short one-piece ladder. They might attract the attention of one of the great judges and be invited to follow his circuit, that is, to accept cases before him as he went from the assizes of one county to those of another. Such men were in line for a career. Or the young lawyer might attract the attention, not of a judge, but of a great London lawyer who would turn over cases he could not accept to the young man, or who might whisper to friends, until word got around that the young man was likely to be heard from.

Of course, many of the lawyers gained their practice through family influence. A young attorney settling in Chancery Lane found it quite natural that a gentleman from his native county of Shropshire who came to London to get legal advice should visit him and retain his services. In fact, attorneys friendly to his family in several towns of that county would frequently send him their business before the King's courts at Westminster. There were,

indeed, barristers who cultivated attorneys in the hope of getting business, but the best of them avoided that method of gaining clients.

Men did not, as they do today, gain a large practice by having taken part in some cause celebre. There was little publicity for barristers, except in the legal profession itself; though it is possible that lawyers who made famous arguments in Parliament thereby gained fame which benefited their practice. As the reputation of a barrister spread, country boroughs and sometimes ecclesiastical corporations asked him to take on their business and paid him an annual fee for it. Indeed, gentle families would occasionally retain a barrister at so much a year.

Some lawyers found the going slow at first. They were usually those who had been reckoned plodding students, and had only by intense application, and possibly by pressure from friends been called to the bar. They could not tender their services to anyone, but had to sit gaping in their chambers until someone chanced to knock at the door. In the meantime they might make a living by working in the offices of more successful men, or gain clerkships, or small offices with fees attached. Sooner or later some of these plodders did rather well. There was always use for men with stored memories. One lawyer was called "Index," and men went to him for information rather than interpretation.

About country lawyers we know less than we could wish. It is evident that some men who had been called to the bar settled in corporate towns where they saw opportunities for business. Many of the country lawyers were probably not barristers, although they may have had a year or two at one of the Inns of Court or of Chancery. Much of their law they had picked up from other attorneys under whom they had served at first, some of it no doubt from manuals,

and more from experience. They did paper work of all kinds; conveyancing, drawing of deeds, making of marriage settlements and land transfers. But they appeared also before borough courts and in quarter sessions. In those sessions they defended petty criminals and no doubt taught them the many methods of legal delay. Some of them knew the art of bribing juries. As one lawyer explained, he never practiced before a judge, but confined himself to quarter sessions where he had "good gettings."

Although country lawyers and London lawyers with country clients served many classes, yeomen and tradesmen and occasionally even husbandmen, most of their work was with the landed families. In some instances the lawyer for a family was also its steward. Such a post was naturally profitable. Land was held by many kinds of tenures and leases that afforded opportunities for quarrels. Country gentlemen were often self-willed men, insistent upon what they believed were their rights and ready to go to law to maintain them. It was a quarrelsome generation and lawyers benefited. The gentlemen often paid the lawyer by giving him long leases because he did not have the cash at hand, and the lawyer knew how to make such leases grow in value. Moreover he was on the inside of family and community affairs and knew who was in straits and needed to sell quickly. He knew when and how to pick up at a bargain a good meadow or a piece of woodland.

In Warwickshire lawyers graduated rapidly into country gentlemen. Dynasties of lawyers can be traced in that county. One of them might serve half a dozen families, and his son and grandson might continue to do so, even after he had a coat of arms, or quarterings, over his front door.

It was a convention in the early seventeenth century, as in other times,

to speak ill of lawyers. They were ignorant of Latin and pretended to know more than they did. They persuaded landlords to increase their rents and they made quarrels in order to compound them. They searched through the penal statutes and found good men liable for infractions of forgotten laws. They leaped over hedge and ditch, as an Elizabethan poet put it, and taught the gentleman how to undo his tenants about boundaries and rights in fields. They undid the gentleman himself and got his estates from him, and then slept in purple and warm furs. Stories often circulated about various lawyers that they had taken great advantage of the gentlemen who retained them, and would, indeed, soon have the entire estate for themselves. But the truth frequently was that the lawyer, by his long search for lost documents and by his talent as a sleuth, had won a whole parcel of manors for the gentleman and deserved even more than his employer had bestowed upon him.

The lawyers were probably not worse or better than other men of their time. They were more successful than most because they had a skill much in demand, and thus roused envy. It must not be forgotten that as students they had had ideals set forth to them by their elders. The leaders of the Inns urged young men to give counsel in good causes and to discourage those who had evil causes. They laid emphasis upon gentility as requisite for those entering the Inns because they hoped thus to enroll in the profession men of traditions honor. Their hopes may have been often disappointed, but not always. One remembers attorneys who little valued the profits of their practice and were ready to give any man counsel, especially to poor clients. One could name many lawyers of that time whose general character makes us feel certain of their professional integrity. It was not merely the advice of his elders in the profession that weighed with the young lawyer. His whole training had made for thoroughness and precision of statement and must have led to intellectual honesty and honesty of conduct.

APPENDIX B-1

Biserial r for Items of
Psychological Test Standardization

r	M-1	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9	M-10	M-11
.96-1.00											
.91- .95			2								
.86- .90					1			1	1		
.81- .85		1			1						
.76- .80		1	1		1				1		
.71- .75	1	2	1	1			1	2	1		1
.66- .70	1	3	1	1	1	1	1	5	2	2	1
.61- .65	4		2	2	3	3	2		5	5	3
.56- .60		2		5	3	2	4	1	3	2	3
.51- .55	5	7	6	3	2	4	4	3	4	1	4
.46- .50	5	2	3	3	8	2	3	5	3	4	3
.41- .45	3	4	2	4	2	7	1	4	2	3	5
.36- .40	6	2	2	2		5	2		1	8	2
.31- .35		1	3	3	3	3	4	1	2	1	
.26- .30	1	2	3	2	1		3	4	3	1	3
.21- .25	2	1	1		2			2			2
.16- .20			1	2			1			1	1
.11- .15							2				
.06- .10						1					
.01- .05											
- .00											
Median	.4800	.5267	.5100	.4767	.4975	.4459	.4767	.4900	.5475	.4600	.4267

APPENDIX B-2

Per Cent Passing for Items of
Psychological Test Standardization

%	M-1	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9	M-10	M-11
96-100											
91-95		4	1	3	1		3	1	2	1	1
86-90	3	1		2	3		1	3	2	1	1
81-85	1	2	5		1	2	3	3	1	2	4
76-80	1	3	2		3	1	3	1	1	3	1
71-75	4	2	1	1	5	2	1	4	5		4
66-70	3	1		1		2		1	1	2	1
61-65	2	1	5	6	1	3	3	1	2	2	2
56-60	6	3	1	2	4	1	2	1	2	2	3
51-55	4	2	5	4	1	5	1	3	4	2	4
46-50	1	2	2	1		4	2		1	2	1
41-45					3	1	1	1		3	
36-40	1	3	2	1	4	2	2	1	4	3	1
31-35		4		2	1	2	3	1	2	2	2
26-30			1	2		1	2	3	1	2	1
21-25			1		1	1	1	1			
16-20	2		2	3		1		3		1	2
11-15											
6-10											
1-5											
Median	61.0	61.0	61.0	58.5	61.0	53.0	61.0	61.0	61.0	53.5	61.0

APPENDIX C

Raw Scores, Corrected for Chance

Listening Group	Listening Aid Study - Baseline Data: Revised Test Questions Only M-1	Revised Test Questions Only M-2	Mean M-1 & M-2	Listening Aid Study Extension: Retention of Skill M-3	Retention of Skill M-4	Review Techniques M-1	Review Techniques M-2
S-1	9.00	7.50	8.25	15.75	10.50	13.00	6.75
S-2	9.75	10.25	10.00	2.75	6.00	4.00	3.75
S-3	13.50	8.00	10.75	12.25	10.75	16.75	14.25
S-4	5.50	6.75	6.12	-3.25*	1.00	4.75	1.25
S-5	19.25	14.25	16.75	16.75	15.50	21.75	15.50
S-6	21.00	17.25	19.12	14.75	12.50	20.50	14.25
S-7	21.50	25.50	25.50	18.00	23.00	25.50	23.00
S-8	1.75	5.50	3.62	-2.00*	3.00	1.75	1.75
S-9	10.00	5.50	7.75	8.25	5.50	9.50	8.00
S-10	10.75	17.00	13.88	6.75	9.25	14.25	8.00
Σ	126.00	117.50	121.74	95.25	97.00	131.75	96.50
Mean	12.60	11.75	12.17	9.52	9.70	13.18	9.65
Reading Group							
S-1	13.50	17.50	15.50	17.00	18.25	16.75	15.50
S-2	15.00	15.00	15.00	16.75	15.75	19.25	15.50
S-3	10.75	13.50	12.12	18.00	10.50	16.75	19.25
S-4	20.75	22.00	21.38	14.50	13.00	24.25	18.00
S-5	10.50	14.25	12.38	3.00	3.00	19.25	10.50
S-6	10.50	10.50	10.50	6.75	6.75	15.50	13.00
S-7	10.50	5.50	8.00	14.25	6.75	9.50	9.00
S-8	11.75	18.25	15.00	16.75	13.00	21.75	14.25
S-9	9.25	4.25	6.75	0.00	7.50	16.75	8.00
S-10	7.50	4.25	5.88	4.25	14.25	9.25	9.25
Σ	120.00	125.00	122.51	111.25	108.75	169.00	132.25
Mean	12.00	12.50	12.25	11.12	10.88	16.90	13.22

*For purposes of calculations, counted as 0.00